

OUTREACH ACTIVITIES IN SPACE SCIENCE AT ALMA COLLEGE. M. C. Borrello¹, M. M. Strait², J. Davis³, J. Gibson⁴ and B. C. Reed⁴; ¹Department of Geology, ²Department of Chemistry, ³Department of Exercise and Health Science, ⁴Department of Physics, Alma College, Alma, MI 48801, USA.

Premise: For the past three summers, Alma College has run a space science camp for junior high school students. The program began as part of the community outreach portion of a NASA/JOVE grant awarded to Alma College. Alma College used faculty expertise along with an active regional educational service district (RESO) to run the program. The RESO in this area sponsors summer programs at local educational institutions and was instrumental in disseminating the appropriate information to prospective students. The program seems to be highly successful as evidenced by full enrollments and repeat students.

Format of the Camp: We planned a four and a half day non-residential camp on the campus of Alma College. The topics to be presented were selected based on the interest and expertise of faculty at the College. The students were on campus from 9 a. m. to 3 p. m. Lunch was provided as part of the fee. We set a limit of 20 students, for four faculty members. We estimate that the program could be run for approximately \$2500, with up to \$1500 coming from the student tuition (\$75 per student) and the rest from outside funding sources, such as the JOVE money or other local or state outreach grants.

During the first four days the students rotated through the activities, seeing each faculty member twice. Each session was two hours long. Lunch was an hour, and the final hour was spent with the group together doing a common activity, such as a planetarium show or a slide/video tour of the solar system.

On the final half day, we had an open house to which we invited the families of the students. We had an opening session where we did an overview of the week's activities and then had the children bring their families to each of the classrooms, where the activities of the week were set up.

Activities: The topics we offered can be divided into three areas: planetary surficial processes, astronomy and life science. The kinds of activities done in each of these areas are summarized below:

Planetary Surfaces - Students looked at types of surficial processes that affect the Earth by looking at how geologic events such as storms and floods change surfaces. Strait then introduced external Earth processes. Simulations were performed to compare impact crater morphology with volcanic craters. We applied what we had seen in the simulations to interpreting imagery obtained from spacecraft. We interpreted two and three dimensional photographs as well as digital images using a computer. In the process we learned about digital image processing and evaluating imagery using the computer as a tool.

Surface Dating - Students learned how to apply absolute and relative dating techniques to planetary

situations. Borrello used a simple experiment to simulate radiometric dating techniques in the age analysis of lunar rocks and meteorites. High resolution images of Mars and the Moon were used to map and date surface materials using superposition and cross-cutting relationships. Crater production curves were constructed and used as a basis for determining relative ages of the different regions on Mars.

Astronomy - Two different faculty members did the astronomy portion in different years. Reed used models of the solar system to study the occurrence of seasons and eclipses. The college planetarium was used in conjunction with a computer based planetarium program to explore the motions of the stars in the sky, and a telescope was set up to observe sunspots.

Gibson used models from the Apollo and shuttle programs to illustrate the mechanics of space travel. Then students worked with a computer simulation program that looked at orbital mechanics. They used the program to calculate apogees, perigees and other orbital parameters.

Life Science - Alma College has an excellent human physiology lab that was utilized for the camp. Davis had the students do measurements at 1 g using an electrocardiograph and an echo cardiograph, instruments flown in the shuttle to monitor crew safety. They simulated weightlessness in the swimming pool and studied changes in the measurements in microgravity. They then designed a simple project they could conduct using the equipment available, for example determining the effects of exercise on the weightless body, where lying down simulated weightlessness.

Outcomes and Evaluation: We were very pleased with the outcomes of this camp. The students seemed to enjoy the work very much and parents relayed their children's excitement at the open house. There are two observations that we would like to share in summary. First, working with this age group presented some challenges for the faculty who were used to working with college-level students. The attention span of the space science students was shorter than that of college students. The younger students also tended to be more resistant to doing certain activities (making calculations on a calculator, for example). Addressing the intellectual level of the students did not seem to be a problem as most of the students were quite bright. The second observation involved the parents. We had good support from the families and usually had at least one representative from each family at the open house. We also had siblings and grandparents in attendance. Many of the parents expressed interest in doing these activities themselves. This has led to the idea of doing this type of outreach program for adults. There is definitely a strong interest in space among the adult population of rural central Michigan.